HALLIBURTON NUS
Environmental Corporation

INTERNAL CORRESPONDENCE

TO: Ted Bittner cc: Don Brenneman

FROM: Shaj Mathew

DATE: April 3, 1992

RE: **Chlorination of Rocky Flats Solar Ponds**

This memo is intended to address chlorination of the contents of Rocky Flats Solar Ponds 207 A, B & C before it can be processed into stabilized waste forms.

BACKGROUND

The Solar Evaporation Ponds 207 A, B, And C have in the course of their existence received discharges of sanitary sewage. This has given rise to varying levels of biological activity. This is evidenced by the gas generation observed in some of the samples received at the Halliburton NUS Laboratories in Pittsburgh. The total plate count analyses of the various sludges confirmed the biological activity (See Attachment 1). However, analytical data on fecal coliform and total coliform contents have indicated that these bacteria are not present in the pond samples. These however might be false negatives since the samples had exceeded their holding times before being subjected to analyses.

REQUIREMENTS/CONCERNS

The presence of pathogenic bacteria in the pond sludges is not desirable from a Health and Safety standpoint. Also, NVO-325 (Nevada Test Site Defense Waste Acceptance Criteria, Certification and Transfer Requirements) states that stabilized waste cannot contain pathogens, which may be present in the waste from the sewage. The bacteria that are the main contributors of pathogenicity are the indicator microbials - fecal coliform, fecal streptococci, enterococci, salmonella and ascaris eggs/clostridium. All of them can be destroyed by chemical means. Because of these considerations, it is a prudent step to disinfect the sludges before the stabilization step.

APPROACH

Chlorine and chlorine compounds are the most common agents that could be used to disinfect the contents of the ponds. The dosages required for disinfection depend on the characteristics of the wastewater. Metcalf and Eddy in their book 'Wastewater Engineering'[1] recommend a maximum range of 6-25 ppm chlorine required for disinfection of untreated wastewater. However, pHs higher than 5 require much higher dosages of chlorine to effect disinfection. For equal concentrations of chlorine added, other conditions being equal, 150 times as much chlorine must be added at a pH of 10

[1] "Wastewater Engineering" Metcalf and Eddy, Inc. McGraw-Hill Book Company, New York, 1972, p. 472.

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than at a pH of 5 to produce the same killing effect[2]. Considering that the pHs of the sludges are above 5, it was decided that an available chlorine content of 2000 ppm would effectively disinfect the contents of the ponds.

The merits and demerits of several options are discussed below:

Chlorine
Liquefied Chlorine gas can be used to achieve the level of desired chlorination. However the safety devices and precautions that have to be designed into such a system are considerable because of the toxicity and corrosivity of chlorine. These are elaborated in greater detail in Attachment 2. This makes it an unsuitable option.

Chlorine Dioxide
The generation of Chlorine dioxide on-site from liquid chlorine has many of the same health and safety problems associated with liquid chlorine. In addition, the other component required to generate Chlorine dioxide (Sodium Chlorite) is ten times as expensive as chlorine.

Calcium Hypochlorite
Calcium Hypochlorite is commercially available in a dry form containing 65% available chlorine. Many of the safety concerns related to the use of liquid or gaseous chlorine are eliminated by the use of this chemical. Based on the estimated volume of the ponds (JT to JZ memo dated March 24, 1992), the 207A&B ponds require approximately 56 tons of Calcium Hypochlorite and the 207C pond would require approximately 7 tons of the chemical. The only downside of this approach would be an incremental addition of about 35% inerts that are present in the Calcium Hypochlorite, to the stabilization mix.

Sodium Hypochlorite
Sodium Hypochlorite can be used instead of Calcium Hypochlorite to effect the disinfection. However, commercially sold Sodium Hypochlorite is a solution with 15% available chlorine. This would mean the addition of a lot more water into the process which would require additional pozzolans to stabilize leading to a far greater amount of final product.

CONCLUSIONS
Since the contents of the Solar Ponds at Rocky Flats have to be disinfected, Calcium Hypochlorite at 2000 ppm available chlorine is the safest and most cost-effective way to accomplish this.

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[2]"Water Supply Engineering" by H. Babbit, J. Doland, and J. Cleasby, McGraw-Hill, New York, 1949, p. 530.

ATTACHMENT 1

BIOLOGICAL ACTIVITY OF PONDS

POND	PLATE COUNTS (colonies/ml)
207A	2000
207B-North	2000
207B-Center	440
207B-South	160
207C	1800